

BIOSOLIDS OBSERVATORY RESULTS AND FINDINGS



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PRELIMINARY REMARKS

- Comprehensive approach : up to 279 parameters tested per sample, more than 7500 analysis results.
- When the results are lower than the LOQ, the latter is used in the different calculations (Min, Max, Mean, Percentiles).
- Rigorous selection of private laboratories ISO 17025 accredited, experienced in Biosolids analysis, guaranteeing the quality of the results and the long-term maintenance of high standard analytical capabilities for future sampling campaigns.



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BIOSOLIDS SAMPLES GEOGRAPHICAL ORIGINS

Country	Sample number
Italy	10
Spain	8
Sweden	5
Germany	2
Slovenia	2
Austria	1
Greece	1
France	1
Total	30



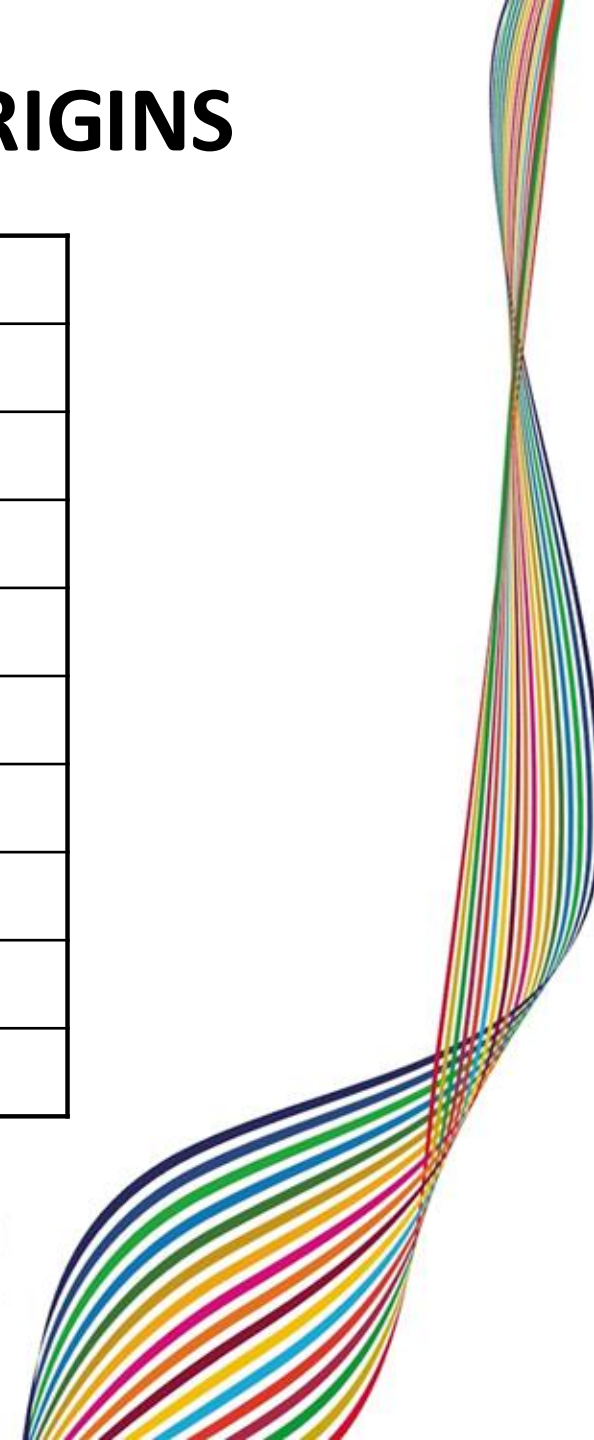
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BIOSOLIDS PRODUCTION SITES

Size & type of Biosolids production site	Number of sites
WWTP < 50 000 pe	7
50 000 < WWTP < 250 000 pe	9
WWTP > 250 000 pe	8
Biosolids hub treatment site	6



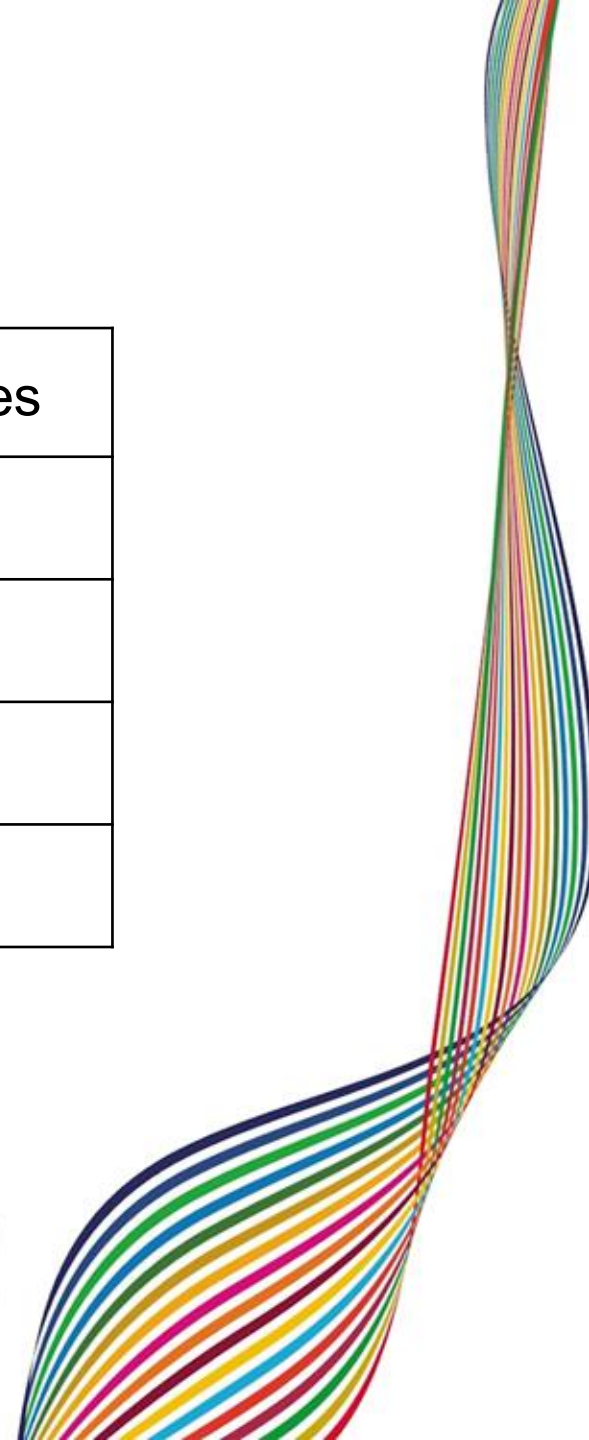
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BIOSOLIDS DESTINATION

Biosolids destination	Number
Land application	22
Thermal treatment	2
Multi outlet	6



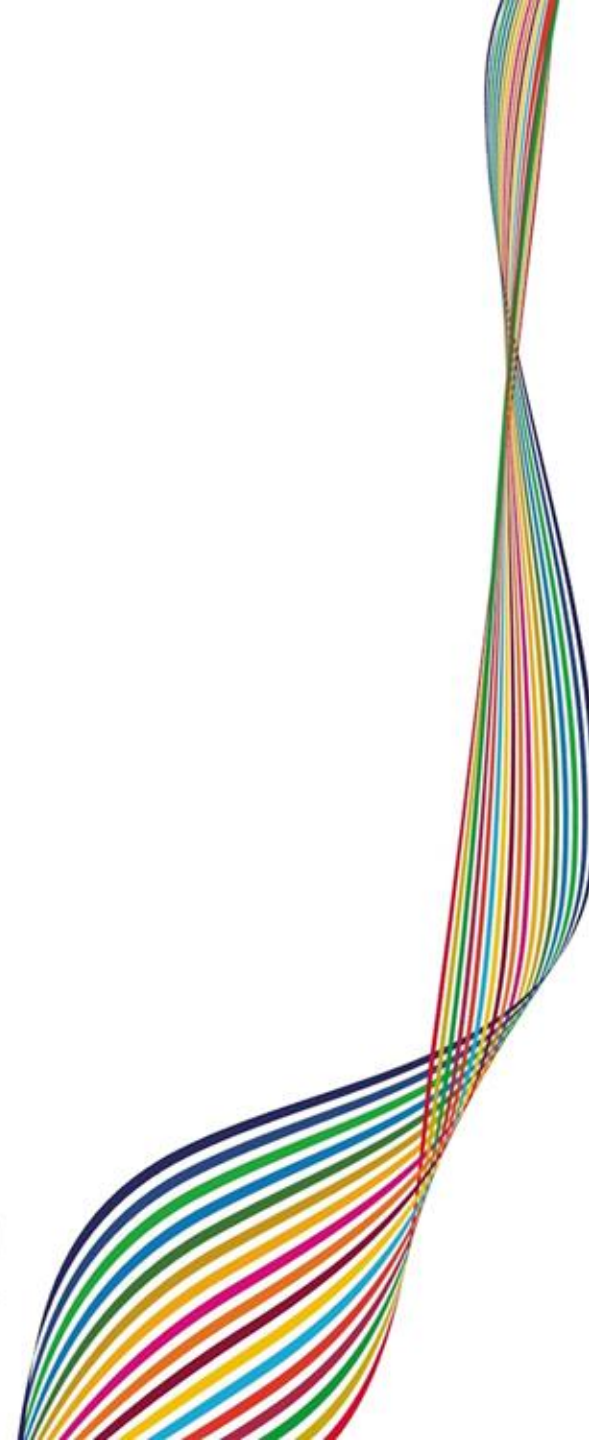
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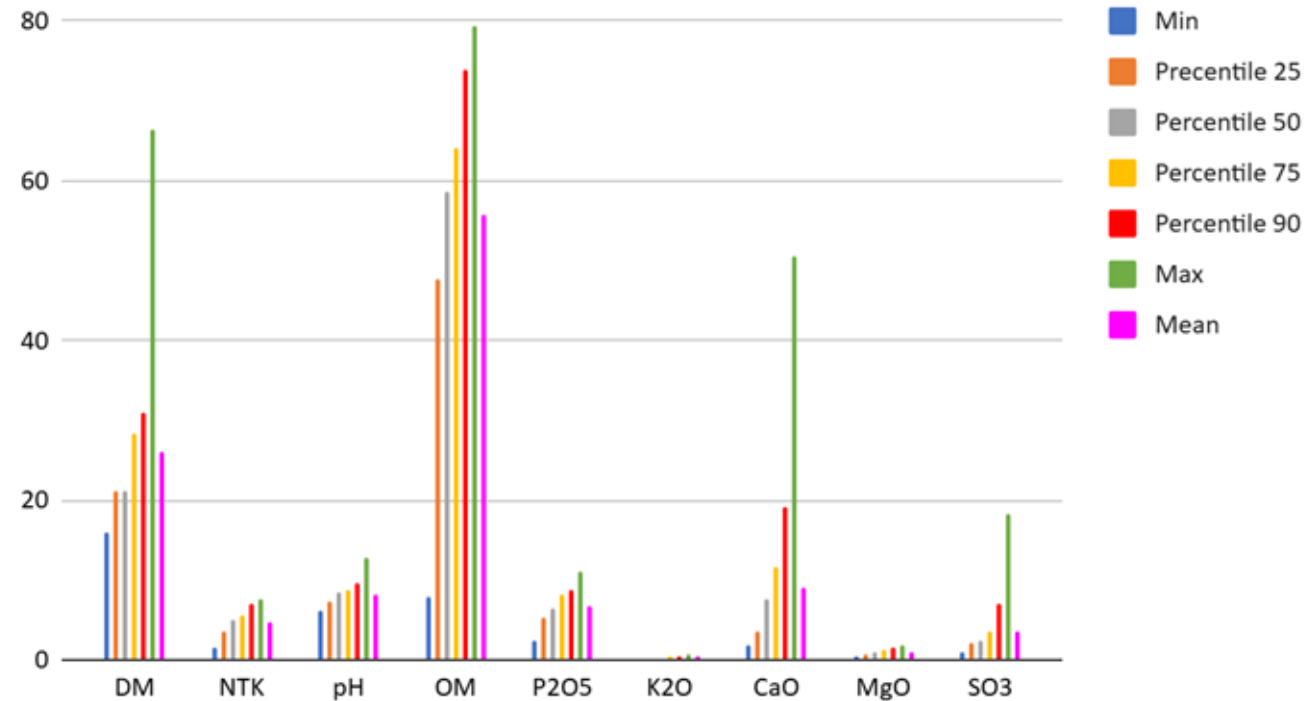
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BIOSOLIDS OBSERVATORY KEY FINDINGS

- Parameters of agronomic interest

Figure 1 : Nutrients content in % on DS



BIOSOLIDS OBSERVATORY KEY FINDINGS

- Inorganic trace elements

	Biosolids Observatory Mean in mg/kg DS	Biosolids Observatory Max in mg/kg DS	Limit value 86/278/EEC Directive in mg/kg DS	Ratio [Max/SSD]
Cd	0.84	2,2	20	11,00%
Cu	252	424	1000	42,40%
Ni	37	122	300	40,67%
Pb	42	113	750	15,07%
Zn	806	1580	2500	63,20%
Hg	0.58	1,9	16	11,88%



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BIOSOLIDS OBSERVATORY KEY FINDINGS

- Organic compounds concentrations

Category	Usage / Origin	Compounds	Mean	Max	EU MS most stringent limit
AOX	Σ of chlorinated, iodinated, brominated and fluorinated compounds		8.8 mg/kg DS	13.4 mg/kg DS	DE : 400 mg/kg DS
Bisphenols	polycarbonate plastics and epoxy resins	BPA	0.9 mg/kg DS	4.8 mg/kg DS	None Soil HL 30 to 90 days
		BFB	0.38 mg/kg DS	2.8 mg/kg DS	
Dioxins & Furans	Combustion, chemical reactions (CI + OC).	Σ TEQ (17)	3.3 ng TEQ/kg DS	14 ng TEQ/kg DS	IT : 25 ng TEQ/kg DS
NP + NPE	Surfactants	NP	18 mg/kg DS	238 mg/kg DS	DK : 10 mg/kg DS (4) Soil HL max 35 days
Organotins	PVC stabilisers and biocides, highly restricted	Monooctyltin	0.16 mg/kg DS	2 mg/kg DS	None Soil HL max 1 year
		Dioctyltin	0.12 mg/kg DS	0.8 mg/kg DS	
		Tributyltin	0.1 mg/kg DS	2.3 mg/kg DS	



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BIOSOLIDS OBSERVATORY KEY FINDINGS

- Organic compounds concentrations

Category	Usage / Origin	Compounds	Mean	Max	EU MS most stringent limit
PAHs	Combustion processes	Σ PAH (9)	0.85 mg/kg DS	4 mg/kg DS	DK : 3 mg/kg DS (1) Soil HL up to 5 years
PBDEs	Flame retardants in furniture, plastics, electronics. Severely restricted	PBDE 47	4 µg/kg DS	10 µg/kg DS	None Soil HL 1 to 2 years
		PBDE 99	5 µg/kg DS	12 µg/kg DS	
		PBDE 203	2 µg/kg DS	7 µg/kg DS	
		PBDE 209	0.30 mg/kg DS	2.27 mg/kg DS	
PCBs	Insulation of closed electric systems. Total ban.	Σ PCB (7)	36 µg/kg DS	68 µg/kg DS	DE + AT 200 µg/kg DS
PFAS	Repellents, firefighting foams. Restriction in progress.	Σ PFAS (6)	36 µg/kg DS	87 µg/kg DS	BE : 40 µg/kg DS (5) Highly persistent



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BIOSOLIDS OBSERVATORY KEY FINDINGS

- Organic compounds concentrations

Category	Usage / Origin	Compounds	Mean	Max	EU MS most stringent limit
Pharmaceuticals	Human health	Azithromycin	0.239 mg/kg DS	1.275 mg/kg DS	None
		Carbamazepine	0.017 mg/kg DS	0.11 mg/kg DS	
		Estrone	0.114 mg/kg DS	0.939 mg/kg DS	
		17a-Ethinylestradiol	0.081 mg/kg DS	0.982 mg/kg DS	
		17-beta-Estradiol	0.098 mg/kg DS	0.692 mg/kg DS	
Phthalates	PVC, cosmetics	DEHP	12 mg/kg DS	41 mg/kg DS	DK 50 mg/kg DS
VOCs	Solvents	Dichloromethane	2.24 mg/kg DS	3.14 mg/kg DS	None
		Toluene	6 mg/kg DS	120.8 mg/kg DS	IT : 100 mg/kg DS (1)
Alkanes	Fuel, lubricants	SCCP MCCP	< LOQ (0.5mg/kg)	< LOQ (0.5mg/kg)	HU : 4000 mg/kg DS
PCNs	Insulation, paintings and coatings		< LOQ (0.2mg/kg)	< LOQ (0.2mg/kg)	Soil HL 5 to 10 years



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BIOSOLIDS OBSERVATORY KEY FINDINGS

- Most of the contaminants comply with the strictest limits set by EU Member states.
- Some contaminants are systematically under detection limits.
- For some contaminants there are significant variations between the mean and max concentrations.
- Contaminants concentrations are not consistently linked with the WWTP size.
- For certain contaminants such as PFAS, the limits of quantification are close to the most stringent regulatory limits.



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BIOSOLIDS OBSERVATORY RECOMMENDATIONS

- Tackling contaminants at source globally (REACH) and locally (Art 14 of the recast UWWTD) is definitely the best option.
- To ensure the safety of biosolids spread on land an enlarge contaminant screening is strongly recommended.
- Benchmark the results and take action for those who deviate from the standard values.



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BIOSOLIDS OBSERVATORY RECOMMENDATIONS

- Implement an analysis program whose scope and frequency is based on contaminants concentrations.
- Map the spreading areas to exclude sensitive zones.
- Take specific precautions to protect particular crops.
- Implement a full traceability scheme.



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MANY THANKS FOR YOUR ATTENTION

If you are interested to participate in future sampling campaigns or in getting the full report drop an email to biosolidsobservatory@gmail.com.



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